600mA LOW DROPOUT LINEAR REGULATOR AP2317

General Description

The AP2317 is a series of low dropout three-terminal regulators with a dropout of 1.1V at 600mA output current.

This product has been optimized for low voltage where transient response and minimum input voltage are critical. The AP2317 provides current limit and thermal shutdown. Its circuit includes a trimmed bandgap reference to assure output voltage accuracy to be within ±1%. On-chip thermal shutdown provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures.

The AP2317 is available in 2.5V and 3.3V versions. The fixed versions integrate the corresponding resistor divider. It is also available in an adjustable version which can set the output voltage with two external resistors.

The AP2317 is available in the industry standard SOT-89-3, SOT-223 and TO-263-3 (for 3.3V only) power packages.

Features

- Low Dropout Voltage: 1.1V at 600mA Output Current
- Output Noise from 10Hz to 10KHz: 0.003% of V_{OUT}
- PSRR at I_{OUT}=300mA and f=120Hz: 75dB
- Output Voltage Accuracy: ± 1%
- On-chip Thermal Shutdown
- Maximum Quiescent Current: I_{QMAX}=5mA
- ESD (Human Body Model): 3.5KV
- Operation Junction Temperature: -40 to 125°C

Applications

- DVD/CD-ROM
- USB Device
- Add-on Card
- DVD Player
- PC Motherboard

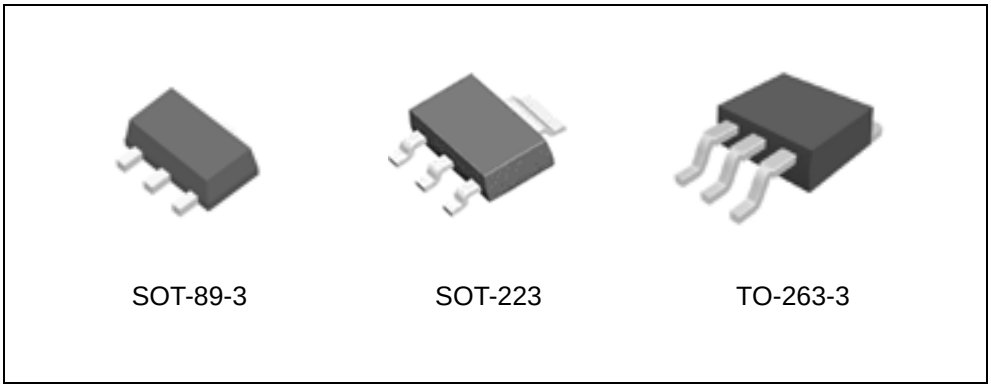
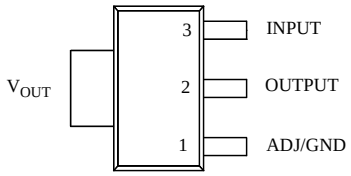


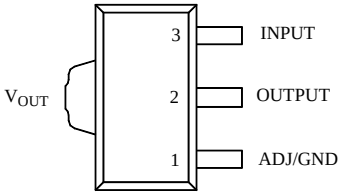
Figure 1. Package Types of AP2317

Pin Configuration

H Package
(SOT-223)



R Package
(SOT-89-3)



S Package
(TO-263-3)

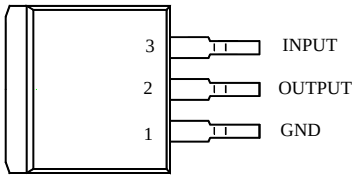


Figure 2. Pin Configuration of AP2317 (Top View)

Functional Block Diagram

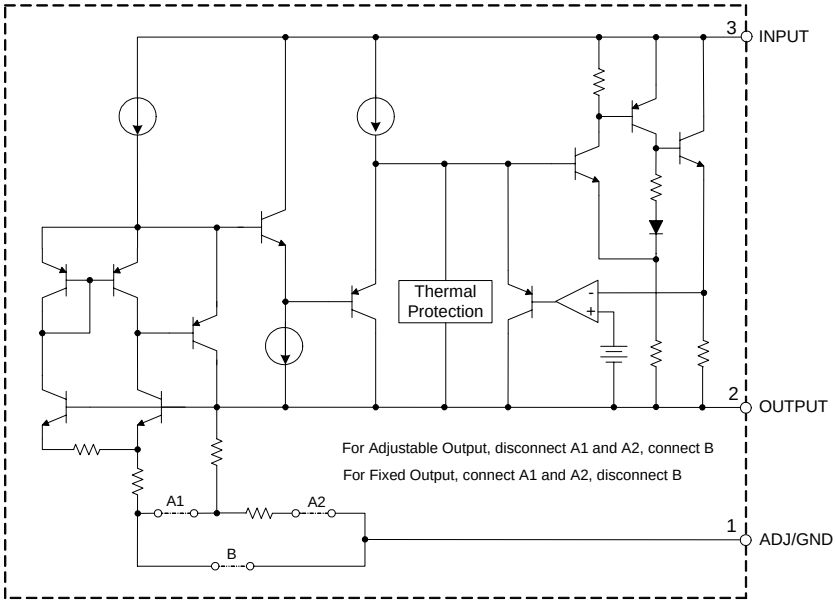
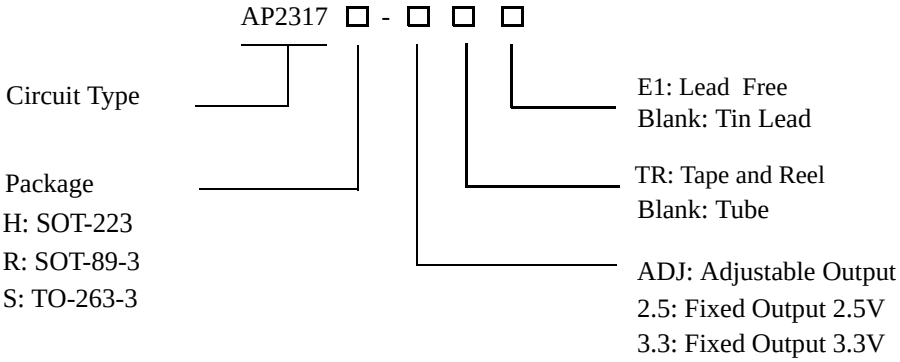


Figure 3. Functional Block Diagram of AP2317

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOT-89-3	-40 to 125°C	AP2317R-ADJTR	AP2317R-ADJTRE1	R27A	E27A	Tape & Reel
		AP2317R-2.5TR	AP2317R-2.5TRE1	R27B	E27B	Tape & Reel
		AP2317R-3.3TR	AP2317R-3.3TRE1	R27C	E27C	Tape & Reel
SOT-223	-40 to 125°C	AP2317H-ADJTR	AP2317H-ADJTRE1	H27A	EH27A	Tape & Reel
		AP2317H-2.5TR	AP2317H-2.5TRE1	H27B	EH27B	Tape & Reel
		AP2317H-3.3TR	AP2317H-3.3TRE1	H27C	EH27C	Tape & Reel
TO-263-3	-40 to 125°C	AP2317S-3.3	AP2317S-3.3E1	AP2317S-3.3	AP2317S-3.3E1	Tube
		AP2317S-3.3TR	AP2317S-3.3TRE1	AP2317S-3.3	AP2317S-3.3E1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Input Voltage	V_{IN}	15		V
Operating Junction Temperature	T_J	150		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260		°C
Thermal Resistance (Note 2)	θ_{JA}	SOT-223	120	°C/W
		SOT-89-3	165	
		TO-263-3	80	
ESD (Human Body Model)	ESD	3500		V
ESD (Machine Model)	ESD	400		V

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note 2: Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, θ_{JA}, and the ambient temperature, T_A. The maximum allowable power dissipation at any ambient temperature is calculated using: $P_{D(max)}=(T_{J(max)} - T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}		12	V
Operating Junction Temperature Range	T_J	-40	125	°C

Electrical Characteristics

Operating Conditions: V_{IN}≤10V, T_J=25°C, unless otherwise specified. (P≤maximum power dissipation)
Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, -40°C to 125°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reference Voltage	V_{REF}	AP2317-ADJ I_{OUT}=10mA, V_{IN}-V_{OUT}=2V, T_J=25°C 10mA≤I_{OUT}≤600mA, 1.4V≤V_{IN} -V_{OUT}≤8V P≤maximum power dissipation	1.238 **1.225**	1.250 1.250	1.262 **1.270**	V
Output Voltage	V_{OUT}	AP2317-2.5 I_{OUT}=10mA, V_{IN}=4.5V, T_J=25°C 10mA≤I_{OUT}≤600mA, 3.9V≤ V_{IN} ≤10V	2.475 **2.450**	2.5 2.5	2.525 **2.550**	V
		AP2317-3.3 I_{OUT}=10mA, V_{IN}=5.0V, T_J=25°C 10mA≤I_{OUT}≤ 600mA, 4.75V≤V_{IN}≤10V	3.267 **3.235**	3.3 3.3	3.333 **3.365**	V
Line Regulation	ΔV_{OUT}	AP2317-ADJ I_{OUT}=10mA, 1.5V≤V_{IN}-V_{OUT}≤10V		0.035	**0.2**	%
		AP2317-2.5 I_{OUT}=10mA, 1.5V≤V_{IN}-V_{OUT}≤10V		1	**6**	mV
		AP2317-3.3 I_{OUT}=10mA, 1.5V≤V_{IN}-V_{OUT}≤10V		1	**6**	mV
Load Regulation	ΔV_{OUT}	AP2317-ADJ (V_{IN}-V_{OUT})=2V, 10mA≤I_{OUT}≤600mA		0.2	**0.4**	%
		AP2317-2.5 (V_{IN}-V_{OUT})=2V, 10mA≤I_{OUT}≤600mA		1	**10**	mV
		AP2317-3.3 (V_{IN}-V_{OUT})=2V, 10mA≤ I_{OUT}≤600mA		1	**10**	mV
Dropout Voltage	V_{DROP}	ΔV_{REF}=1%, I_{OUT}=0.6A		1.1	**1.3**	V
Current Limit	I_{LIMIT}	(V_{IN}-V_{OUT})=2V	0.75	0.9		A
Adjust Pin Current	I_{ADJ}			60	**120**	μA
Adjust Pin Current Change	ΔI_{ADJ}	1.4V≤(V_{IN}-V_{OUT})≤10, 10mA≤I_{OUT}≤600mA		0.2	**5**	μA
Minimum Load Current	I_{LOAD} (MIN)	1.5V≤(V_{IN}-V_{OUT})≤10V (ADJ only)		**1.7**	**5**	mA
Quiescent Current	I_Q	V_{IN}=V_{OUT}+1.25V			**5**	mA
Ripple Rejection	PSRR	f=120Hz, C_{OUT}=22μF Tantalum (V_{IN}-V_{OUT})=3V, I_{OUT}=300mA	**60**	75		dB
Temperature Stability				0.5		%
Long-Term Stability		T_A=125°C, 1000hrs.		0.3		%
RMS Output Noise (% of V_{OUT})		T_A=25°C, 10Hz≤f≤10KHz		0.003		%
Thermal Shutdown		Junction Temperature		150		°C
Thermal Shutdown Hysteresis				25		°C

Typical Performance Characteristics

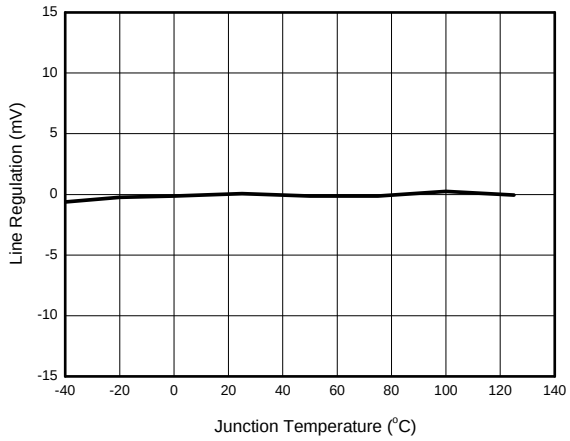


Figure 4. Line Regulation vs. Junction Temperature

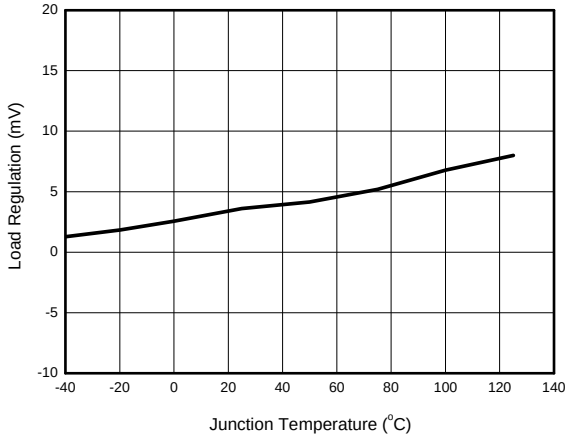


Figure 5. Load Regulation vs. Junction Temperature

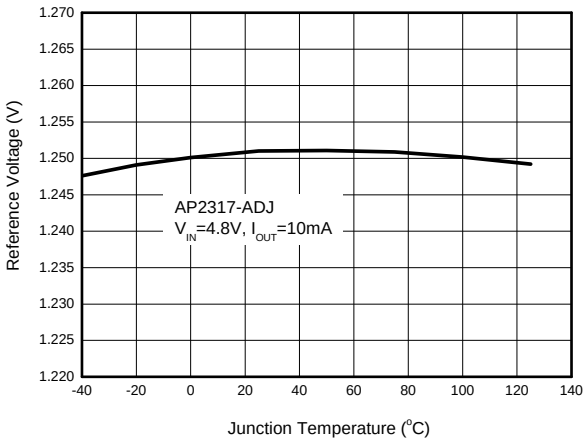


Figure 6. Reference Voltage vs. Junction Temperature

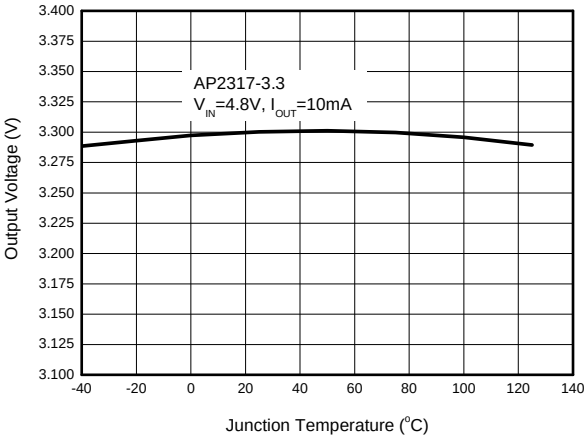


Figure 7. Output Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

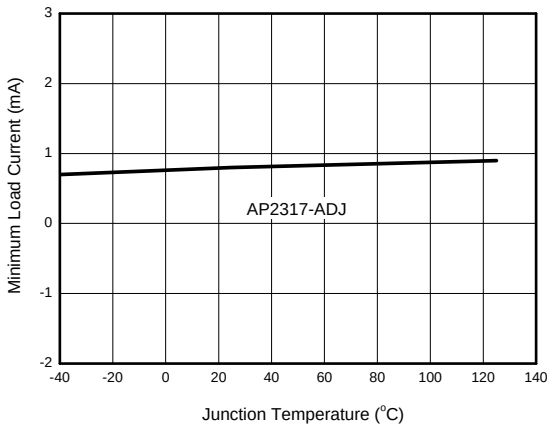


Figure 8. Minimum Load Current vs. Junction Temperature

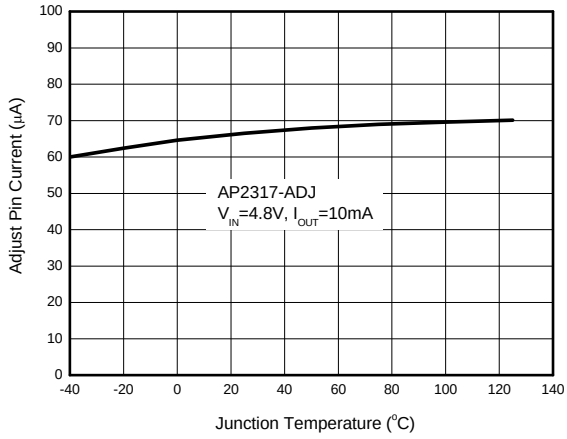


Figure 9. Adjust Pin Current vs. Junction Temperature

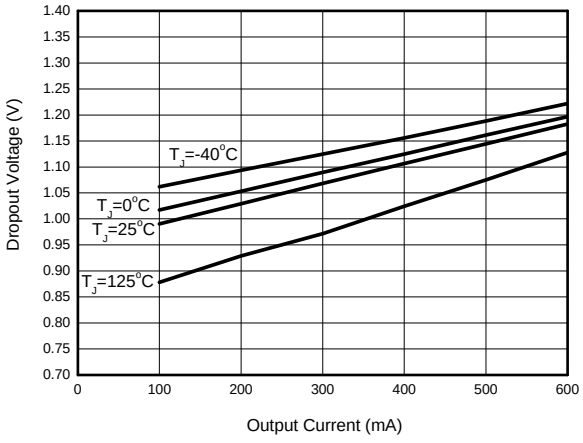


Figure 10. Dropout Voltage vs. Output Current

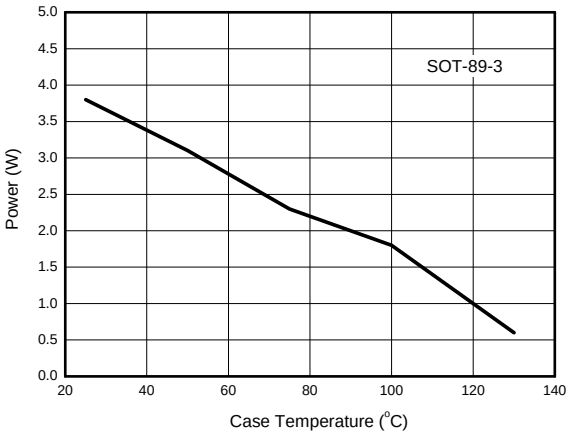


Figure 11. Maximum Power Dissipation

Typical Performance Characteristics (Continued)

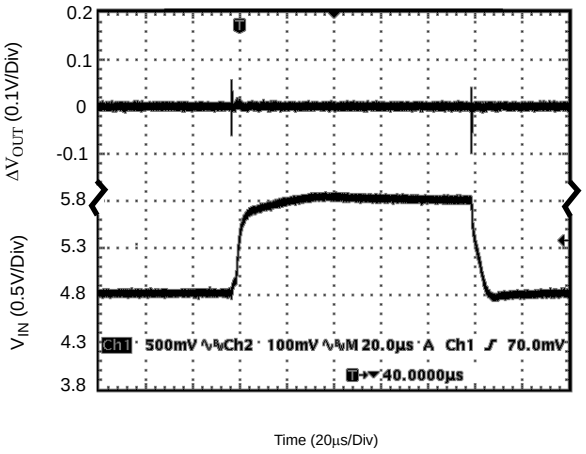


Figure 12. Line Transient Response
(Conditions: V_{IN}=4.8 to 5.8V, V_{OUT}=3.33V, I_{OUT}=0.1A, C_{IN}=1µF, C_{OUT}=10µF)

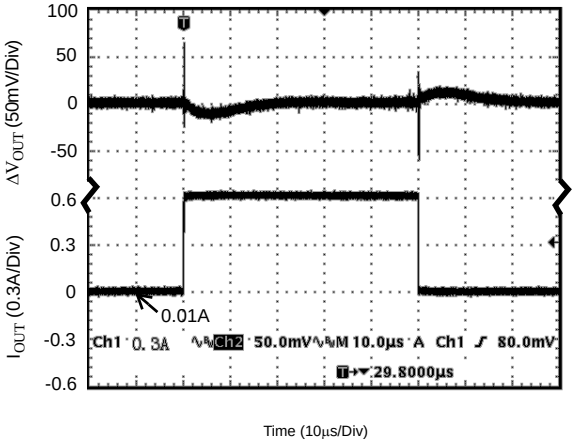


Figure 13. Load Transient Response
(Conditions: V_{IN}=4.8V, V_{OUT}=3.33V, I_{OUT}=0.01 to 0.6A, C_{IN}=C_{OUT}=10µF)

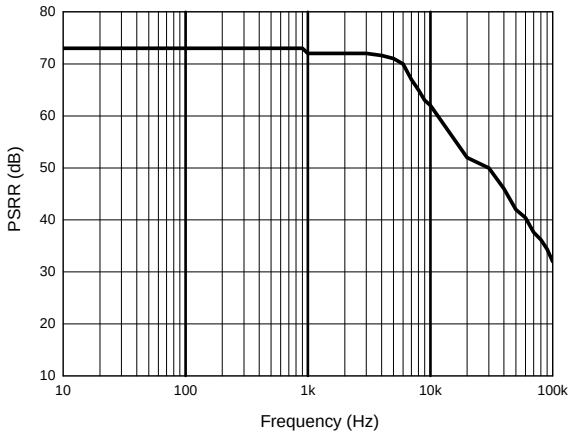


Figure 14. PSRR vs. Frequency

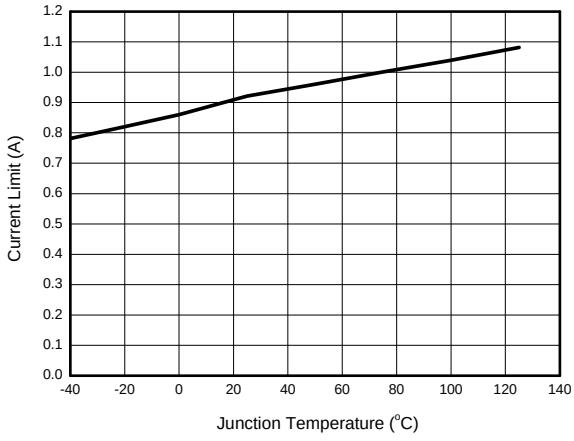


Figure 15. Current Limit vs. Junction Temperature

Typical Applications

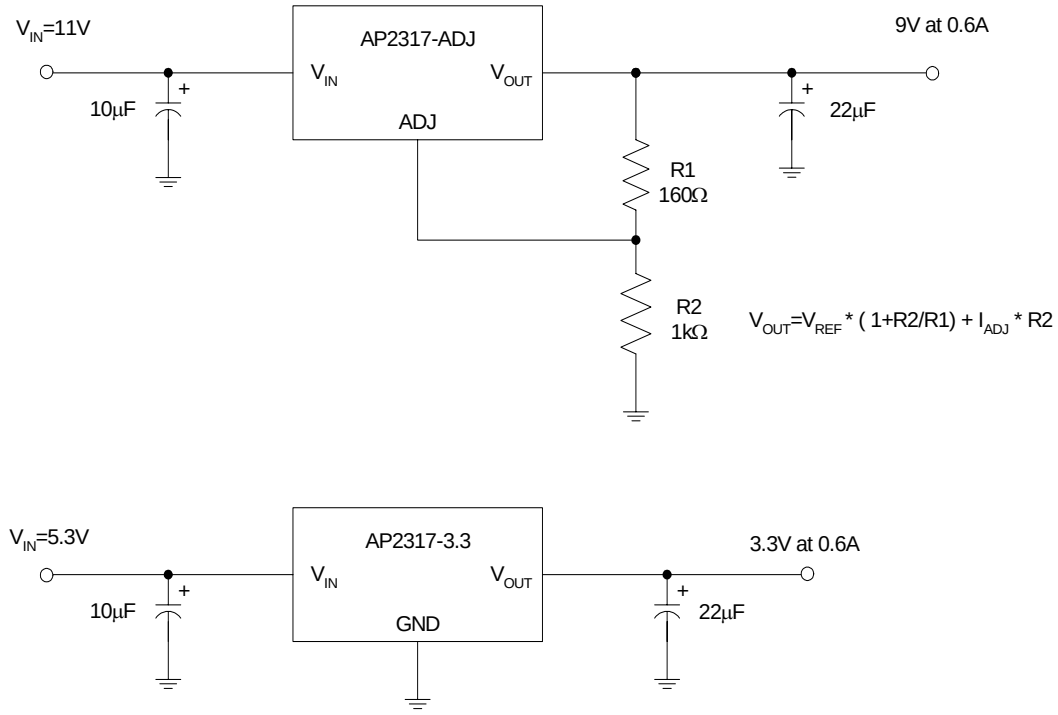
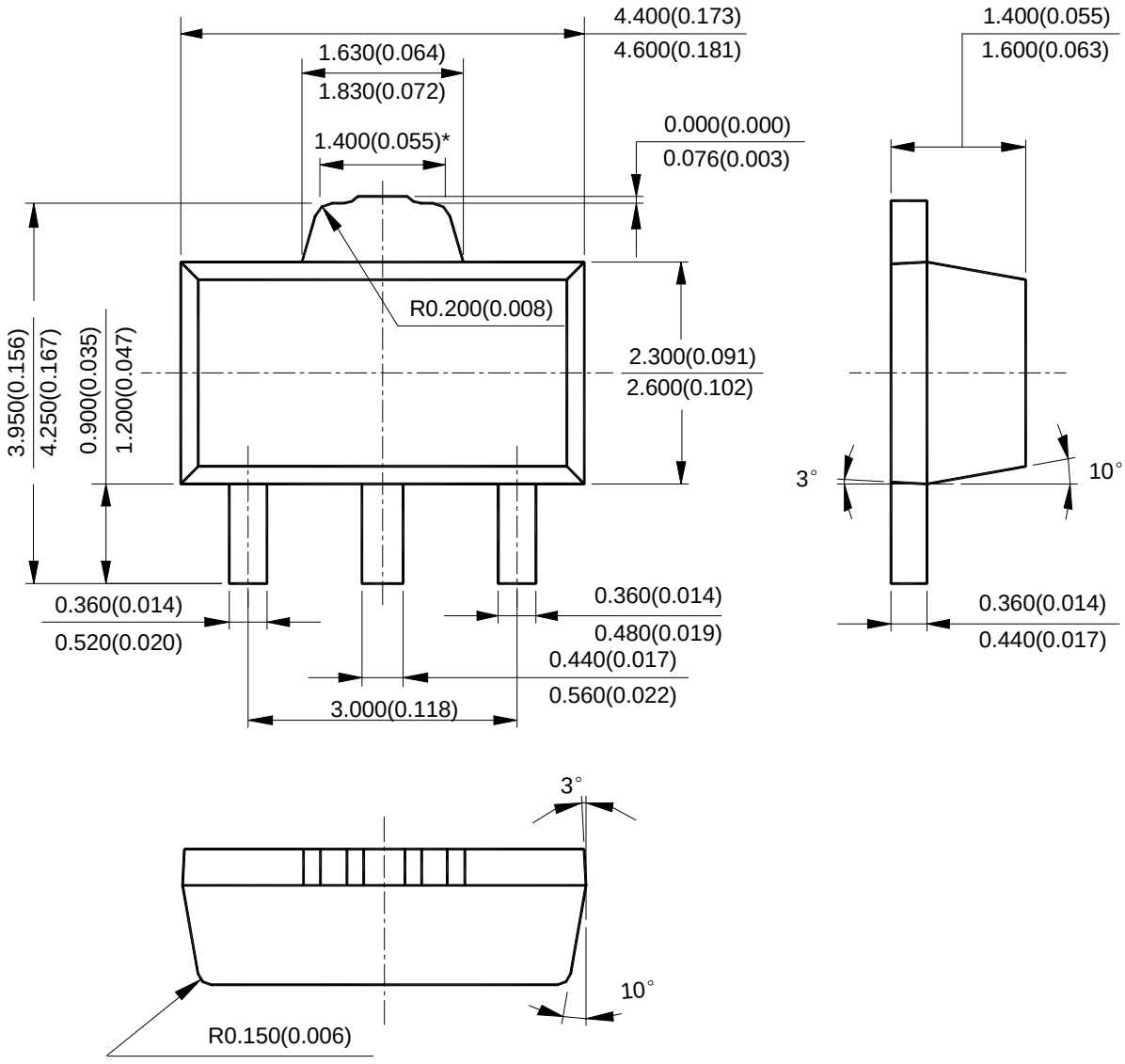


Figure 16. Typical Applications of AP2317

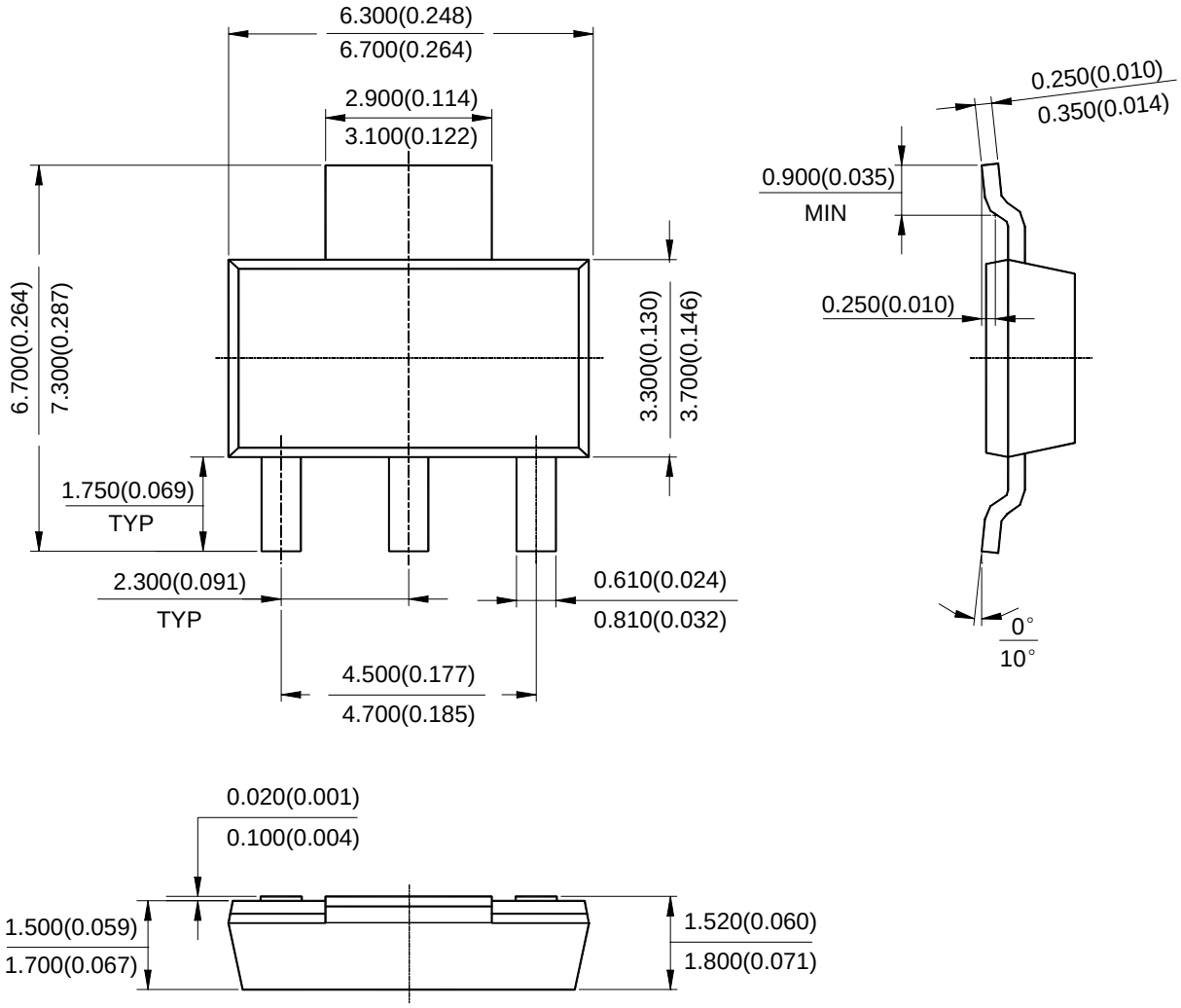
Mechanical Dimensions

SOT-89-3 **Unit: mm(inch)**



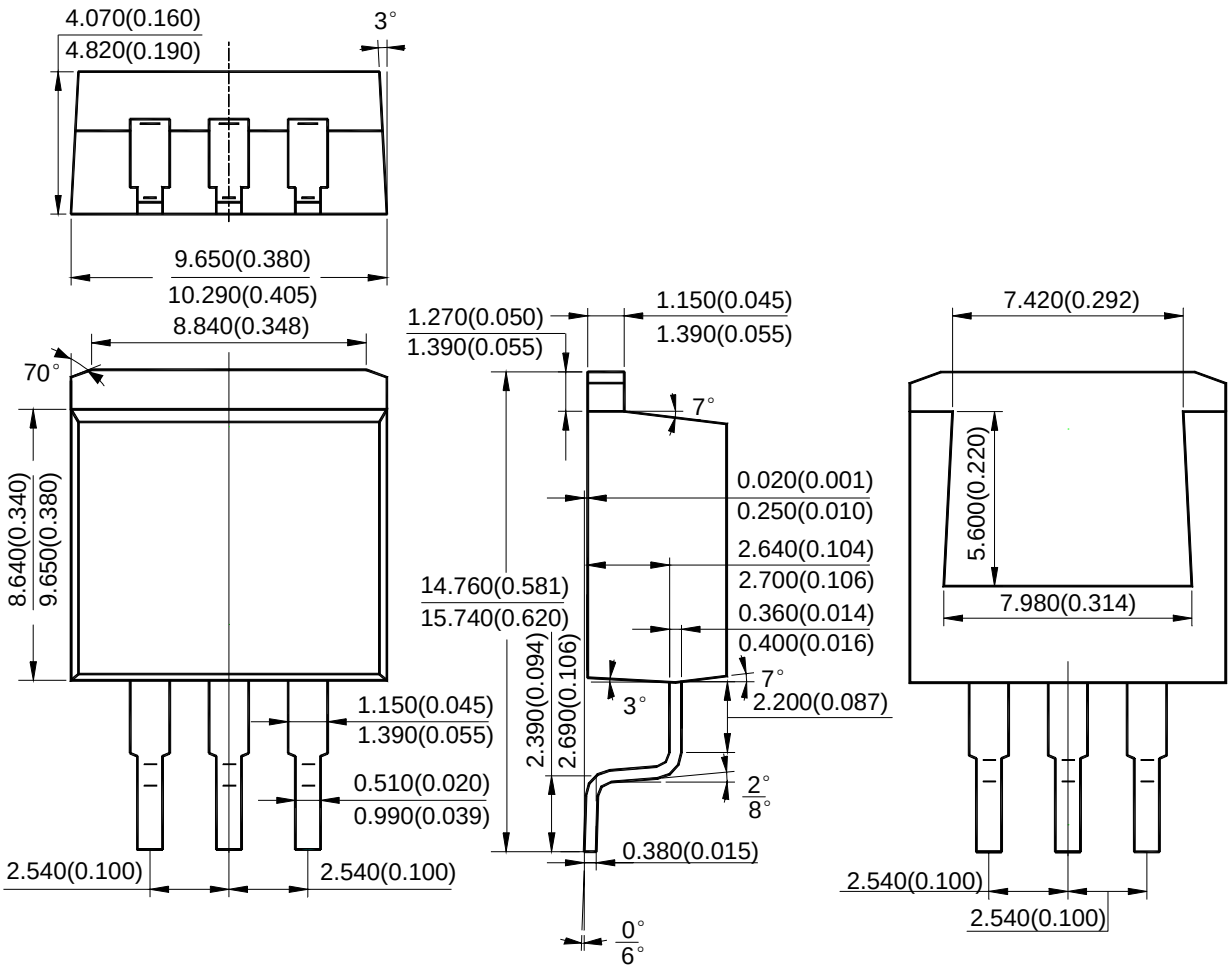
Mechanical Dimensions (Continued)

SOT-223 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

TO-263-3 **Unit: mm(inch)**



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